

# PATENT ABSTRACTS OF JAPAN

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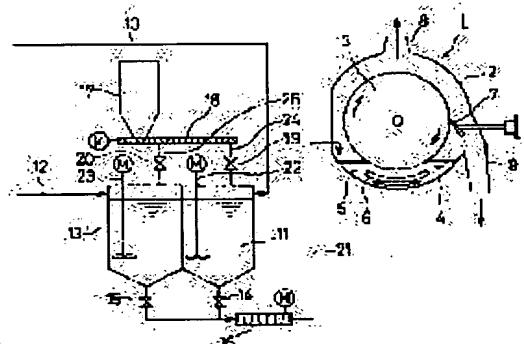
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## (54) TREATMENT OF LIQUID CONTAINING MATERIAL TO BE SOLIDIFIED BY DIP TYPE DRUM DRYER

### (57) Abstract:

**PROBLEM TO BE SOLVED:** To unnecessary a complicated operation such as frequent cleaning of the inside of a pan after operation is temporarily stopped and to continuously perform treatment for a long term by alternately repeating a process for feeding a liquid to be treated and a process for stopping the supply of the liquid to be treated and to feed a liquid diluent.

**SOLUTION:** This method comprises using a dip type drum dryer 1 in which a liquid to be treated 5 fed into a pan 4 is brought into contact with a drum 3 rotating to stuck the liquid to be treated 5 on the surface of the drum 3 and drying the liquid to be treated 5 by a heating means to solidify a material to be solidified. Here, the treatment is performed while alternately supplying the liquid to be treated 5 and a liquid diluent to the pan 4 every fixed time. That is, the liquid to be treated 5 and the liquid diluent are alternately fed into the pan 4 by a liquid transfer pump 16 by alternately opening and closing every fixed time an opening/closing valve 14 of a liquid to be treated-storage tank 11 and an opening/closing valve 15 of a liquid diluent storage tank 13. In this way, there is no possibility of the material to be solidified being extremely concentrated in the liquid to be treated in the pan.



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CLAIMS

## [Claim(s)]

[Claim 1] In the pan of a DIP type drum dryer, the processed liquid containing the solidification treatment-ed matter is supplied. Make the drum which rotates this processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by repeating by turns the process which supplies the processed liquid containing the solidification treatment-ed matter in said pan, and the process which suspends supply of this processed liquid and supplies a diluent in a pan, and performing it.

[Claim 2] In the pan of a DIP type drum dryer, the processed liquid containing the solidification treatment-ed matter is supplied. Make the drum which rotates a processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by supplying a diluent in a pan intermittently while supplying the processed liquid containing the solidification treatment-ed matter in said pan.

[Claim 3] The art of solidification treatment-ed matter content liquid with the DIP type drum dryer according to claim 1 or 2 characterized by adding a solidification regulator in a processed liquid and a diluent.

[Claim 4] The art of solidification treatment-ed matter content liquid with a DIP type drum dryer given in claim 1 characterized by a processed liquid containing the high-boiling point matter thru/or any 1 term of 3.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the art of solidification treatment-ed matter content liquid with a DIP type drum dryer which carries out solidification treatment of salts, the organic substance, etc. which are contained in processed liquids, such as wastewater, and collects them.

#### [0002]

[Description of the Prior Art] In wastewater of industrial liquid waste, a research facility, etc., various salts, organic substance, etc. contain in the condition of having dissolved or distributed. He is trying to stock a river etc., after there being a possibility of producing an environmental pollution problem, therefore performing demineralization processing and organic substance decomposition processing generally and adjusting to the water quality within the permitted limits, if wastewater containing such salts and the organic substance is discharged in a river etc. as it is.

[0003] In this case, when the impurity (salts, organic substance) concentration under wastewater is high, heat-treatment removes a solvent (or dispersion medium), and solidifying a solute (or dispersoid) and carrying out separation removal is performed. Although this approach is useful especially in the perfect closed system with which wastewater discharge is not allowed, since it can also generally discard in the form of a solid, the abandonment approach can also be referred to as being an advantageous approach in the point of becoming easy the top where \*\* is small and handling is easy.

[0004] The art using a DIP type drum dryer which contacts processed liquids, such as wastewater, to the rotating drum equipped with the heating means as an approach of performing solidification treatment, dries the processed liquid adhering to a drum front face, and makes the salt and the organic substance (henceforth the solidification treatment-ed matter) in a processed liquid solidify is known. In processing by this DIP type drum dryer equipment, the approach of processing, while supplying a processed liquid to the depot called a pan continuously at a fixed rate conventionally is adopted.

#### [0005]

[Problem(s) to be Solved by the Invention] However, the amount of the solidification treatment-ed matter in the processed liquid supplied in the pan in fixed time amount and the amount of the solid by which desiccation solidification was carried out with the drum dryer are not necessarily in agreement, and the imbalanced condition of usually saying that there is little latter one produces them. This is considered to originate in the phenomenon of fall into the natural evaporation from the oil level of pan endothecium processing liquid, and some pans of the scratched solid. For this reason, the amount of the solidification treatment-ed matter in the processed liquid in a pan increases gradually with progress of the processing time. When concentration of the solidification treatment-ed matter in the processed liquid in a pan advances, it may stop adhering to a drum at homogeneity, and when a processed liquid is going too far, stirring of the processed liquid in a pan may become difficult. For this reason, the complicated activity of suspending operation in the phase in which the liquid concentration in a pan rose, removing a pan from equipment casing, discharging the processed liquid in a pan, and cleaning the inside of a pan conventionally was required. When the concentration in the processed liquid in a pan progressed comparatively gently, the cleaning frequency in a pan was also low, it ended, and so big trouble was not caused to processing, but like [ when the suspended solid contains, for example in the processed liquid ], when the concentration rate in pan endothecium processing liquid was remarkable and quick, there was a problem that cleaning in a pan had to be performed frequently.

[0006] Moreover, even if it is the case where concentration of the solidification treatment-ed matter in pan endothecium processing liquid is not advancing so much scraping at the time of the solid by which desiccation

solidification was carried out on the drum front face with concentration of the solidification treatment-ed matter in a processed liquid being sticky, or becoming hard too much, and exfoliating a solid from a drum, when description etc. becomes poor, or even if some concentration arises When the viscosity of a processed liquid, the viscosity of a dry matter, etc. change remarkably and cause trouble to processing actuation, it is necessary to perform cleaning in a pan frequently. For example, when high-boiling point alcohol contains in the processed liquid, since high-boiling point alcohol is [ be / it / under / pan endothecium processing liquid / setting ] inferior to the adhesion over a drum front face compared with salts, a concentration degree is large. The high-boiling point alcohol content in the solid by which desiccation solidification was carried out on the drum front face also became high as the concentration of the high-boiling point alcohol in pan endothecium processing liquid became high, but in whenever [ in the usual drum front face / stoving temperature ], the viscosity of a solid became high and high-boiling point alcohol had the problem that the scraping nature of a solid got worse in order not to carry out desiccation solidification.

[0007] This invention was made in view of the above-mentioned point, suspends operation of a DIP type drum dryer, and does not need complicated actuation of performing cleaning in a pan frequently, but it aims at offering the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which can process continuously for a long time.

[0008]

[Means for Solving the Problem] This invention supplies the processed liquid containing the solidification treatment-ed matter in the pan of (1) DIP type drum dryer. Make the drum which rotates this processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter The process which supplies the processed liquid containing the solidification treatment-ed matter in said pan, The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by repeating by turns the process which suspends supply of this processed liquid and supplies a diluent in a pan, and performing it, (2) The processed liquid containing the solidification treatment-ed matter is supplied in the pan of a DIP type drum dryer. Make the drum which rotates a processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter While supplying the processed liquid containing the solidification treatment-ed matter in said pan The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by supplying a diluent in a pan intermittently, (3) The above (1) characterized by adding a solidification regulator in a processed liquid and a diluent, or the art of solidification treatment-ed matter content liquid with a DIP type drum dryer given in (2), (4) Let the art of solidification treatment-ed matter content liquid with a DIP type drum dryer the above (1) characterized by a processed liquid containing the high-boiling point matter thru/or given in any 1 term of (3) be a summary.

[0009]

[Embodiment of the Invention] Hereafter, this invention approach is explained based on a drawing. Drawing 1 is the explanatory view showing an example of the flow of the DIP type drum dryer equipment concerning operation of this invention, and drawing 2 is the explanatory view showing other examples of the flow of the DIP type drum dryer equipment concerning operation of this invention. In drawing 1 and drawing 2 , 1 is a DIP type drum dryer and the drum 3 equipped with the heating means is formed pivotable in the casing 2 of this drum dryer 1. As a heating means of this drum 3, heating-medium supply means, such as steam, are formed in the interior of a drum 3. While a pan 4 is formed under the casing 2 and a processed liquid 5 is supplied in this pan 4, the lower part of said drum 3 is constituted so that it may be immersed in a processed liquid 5. Moreover, in this pan 4, the stirring means 6, such as an agitator for stirring the processed liquid 5 in pan 4, are established. In casing 2, the scraper 7 for scratching a solid from the front face of a drum 3 is formed, and the output port 9 for taking out the scratched solid caudad is formed. Furthermore, the gas exhaust 8 for discharging the evaporated steam is established in the upper part of casing 2.

[0010] The feeder style of a processed liquid and a diluent is connected with the drum dryer 1. The supply line 21 for this feeder style having the processed liquid depot 11 which stores the processed liquid sent from processed liquid liquid-sending Rhine 10, and the diluent depot 13 which stores the diluent sent from dilution liquid transport liquid Rhine 12, and supplying a processed liquid or a diluent in pan 4 of the drum dryer 1 from these depots 11 and 13 is formed.

[0011] 16 ( drawing 1 ), and 16A and 16B ( drawing 2 ) are liquid-sending pumps which supply a processed liquid

and a diluent to a pan 4, and liquid-sending pump 16A of a processed liquid and liquid-sending pump 16B of a diluent are separately installed in the equipment of the flow shown in drawing 1 in the equipment of the flow which showed the both sides of a processed liquid and a diluent to drawing 2 to being constituted so that the liquid may be sent with the common liquid-sending pump 16. 14, the closing motion valve which prepared 15 in the outlet side of the processed liquid depot 11 and the diluent depot 13, respectively, and 22 and 23 are the stirring means formed in each depots 11 and 13, respectively.

[0012] This invention is carried out using the equipment constituted like the above. this invention -- scraping of a solid -- although it is the purpose which improves description etc. and a solidification regulator can be mixed to a processed liquid and a diluent if needed, when carrying out addition mixing of this solidification regulator, the equipment which comes to attach the device for supplying a solidification regulator to each depots 11 and 13 is further used for the above-mentioned equipment configuration.

[0013] Such a feeder style consists of supply lines 24 and 25 which connect the feeder 18, the feeder 18, and each depots 11 and 13 for supplying a solidification regulator with the processed liquid depot 11 and the diluent depot 13 from the hopper 17 which stores a solidification regulator, and this hopper 17, and closing motion valves 19 and 20 prepared in each supply line, as shown in drawing 1 and drawing 2.

[0014] Although what matter (solidification treatment-ed matter) which should be solidified, such as salts and the organic substance, dissolved and/or distributed is mentioned, for example to the drainage system medium which makes water and water a subject as a processed liquid, the medium which the solidification treatment-ed matter dissolves and is distributed is not necessarily restricted to water. Moreover, the solidification treatment-ed matter may be used not only as that by which disposal is carried out but as a product. Therefore, like plating waste fluid, lab waste fluid, an ion-exchange-resin playback effluent, etc., this invention approach can be applied, also when solidifying and collecting products from processed liquids, such as a water solution which contains [ like ] a product when performing the solidification of food and disintegration else [ in the case of processing the wastewater discharged mainly from works or a research facility as a processed liquid ]. In addition, the viscous matter with which the desiccation solidification of the solidification object obtained in this invention is not carried out at the part may be contained. Although operation of this invention approach is possible even if there is for example, high-boiling point matter (for example, high-boiling point alcohol, such as a glycerol) as such viscous matter and such high-boiling point matter contains, it is desirable to carry out addition mixing of the solidification regulator in this case, so that it may mention later.

[0015] When a processed liquid is wastewater, and the concentration of impurities, such as salts under wastewater, is comparatively low, it is not a best policy economically to apply such low-concentration wastewater to this invention approach directly. Although demineralization processing of such comparatively low-concentration wastewater is usually carried out by the reverse osmotic membrane method, an electric-type deionization method, etc., the retentate produced by the demineralization processing processing with the application of such retentate to this invention approach, since salt concentration's is high is that a top is also actually desirable.

[0016] On the other hand, the solvent in a processed liquid or a dispersion medium, and a liquid of the same kind are usually used that what is necessary is just the liquid which can dilute a processed liquid as a diluent. For example, also as for a diluent, in the case of the drainage system medium by which the processed liquid made the subject the water which dissolves or distributed the solidification treatment-ed matter, and water, it is usually desirable to use water or a drainage system medium.

[0017] It processes in one example of this invention approach, supplying a processed liquid and a diluent to a pan 4 by turns for every fixed time amount using the equipment of the flow shown in drawing 1 . A processed liquid and a diluent are supplied to a pan 4 by turns with the liquid-sending pump 16 by opening and closing the closing motion valve 14 of the processed liquid depot 11, and the closing motion valve 15 of the diluent depot 13 by turns for every fixed time amount. Although the speed of supply of a processed liquid and a diluent changes with whenever [ rotational-speed / of a drum 3 /, and stoving temperature ], and the class of processed liquid, presentations, etc. and it cannot necessarily determine uniquely, as for 20 - 40 kg/m<sup>2</sup> and time amount extent, and the speed of supply of a diluent, it is [ the speed of supply of a processed liquid ] usually desirable to consider as 20 - 40 kg/m<sup>2</sup> and time amount extent.

[0018] A pan 4 is followed in a processed liquid and it can decide on the time amount which can be supplied suitably in consideration of various conditions, such as size of the class of solidification treatment-ed matter in a processed liquid, concentration, and the rate by which the solidification treatment-ed matter is condensed in a processed liquid in pan 4. For this reason, it is desirable for the time amount which can supply a processed liquid to perform conditioning about the processed liquid which is going to process, and to determine in consideration of

the stirring nature of the processed liquid 5 in a pan, the scraping nature from the drum front face of the solid which carried out desiccation solidification, etc. succeeding a pan 4. The time amount which suspends supply of a processed liquid and supplies a diluent to a pan 4 on the other hand follows to supply a diluent as a guide, and it decides on it until it dilutes the solidification treatment-ed matter concentration in pan endothecium processing liquid 5 to the same extent as the concentration of the solidification treatment-ed matter in the original processed liquid. Although the time amount to which the concentration of the solidification treatment-ed matter in pan endothecium processing liquid 5 may be reduced to a predetermined value is suitably determined by supply of a diluent based on the processed liquid concentration in pan 4, the amount of supply per unit time amount of a diluent, etc. In here, pan endothecium processing liquid concentration changes with rates which the solidified object in the continuation supply time amount of the processed liquid into pan 4 and pan endothecium processing liquid 5 solidifies, and are processed out of the processed liquid 5 in pan 4. For this reason, it is desirable to decide also on the continuation supply time amount of a diluent beforehand based on the data of said conditioning etc. [0019] Conditions, such as time amount at the time of supplying a processed liquid and a diluent by turns, and a rate It is also possible to determine the moisture content of pan endothecium processing liquid 5 as a scale. Generally It makes to hold the moisture content of pan endothecium processing liquid 5 to about 30 - 50% of the weight in the case of the processed liquid containing a suspended solid into a standard. It is desirable to supply a processed liquid and a diluent by making into a standard to hold the moisture content of pan endothecium processing liquid 5 to about 40 - 60% of the weight in the case of the processed liquid which does not contain a suspended solid. However, as for the moisture content in pan endothecium processing liquid, it is desirable to perform conditioning and to decide on the speed of supply of a processed liquid and a diluent, supply time amount, etc., as passed and described above to the standard to the last.

[0020] Although whenever [ can surface temperature / of the drum 3 in the drum dryer 1 ] (skin temperature) is determined in consideration of the boiling point of the liquid component in a processed liquid (a solvent or dispersion medium), the melting point of the solidification treatment-ed matter which carries out desiccation solidification, etc., generally it is about 120-140 degrees C. Moreover, the rotational speed of a drum 3 is adjusted so that desiccation solidification of the processed material adhering to drum 3 front face may be carried out while arriving at the location of a scraper 7. Usually, as for the rotational speed of a drum 3, it is desirable to consider as 2 - 10rpm extent.

[0021] The solid by which desiccation solidification was carried out on the front face of a drum 3 can be sticky, or a solidification regulator can be added in a processed liquid and a diluent in order to prevent that become hard too much and the scraping nature of a solid gets worse. As a solidification regulator, there is no solubility over a processed liquid or a diluent, or solubility is a low solid and it is desirable to use the thing on powder. As such a solidification regulator, the diatom earth, a bentonite, etc. are mentioned, for example.

[0022] If the high-boiling point matter with the boiling point higher than whenever [ can surface temperature / of a drum 3 ], for example, a glycerol, tetramethyl ammonium hydroxide (TMAH), etc. are contained in the processed liquid, this high-boiling point matter will be incorporated in the solid by which desiccation solidification was carried out on drum 3 front face, without being gasified. When there are many contents in the processed liquid of these high-boiling point matter, or when the concentration in pan 4 advances, the amount which the high-boiling point matter contains in the solid by which desiccation solidification was carried out increases, and it scraping-comes [ a solid is sticky and ] to be hard. Since the high-boiling point matter will become that it is tended with a solidification regulator to adhere a drum if the above-mentioned solidification regulator is added into a processed liquid and a diluent when the high-boiling point matter contains in the processed liquid, in the case of the processed liquid containing especially the high-boiling point matter, addition of a solidification regulator is effective.

[0023] The addition of solidification regulators, such as the diatom earth, is suitably adjusted according to the class of high-boiling point matter contained in a processed liquid, an amount, etc. Usually, as for a solidification regulator, it is desirable to add so that the content in a processed liquid and a diluent may become about 1 - 15 % of the weight.

[0024] Next, the actuation in the case of processing a processed liquid using the equipment of the flow shown in drawing 1 is explained. The closing motion valve 15 is closed, the closing motion valve 14 is opened, and a processed liquid is supplied in pan 4 of the drum dryer 1 from the processed liquid depot 11 with the liquid-sending pump 16. When using the processed liquid which mixed the solidification regulator, the closing motion valve 19 is opened and specified quantity supply of the solidification regulator is carried out into the above-mentioned depot 11 through a feeder 18 from a hopper 17, and it stirs with the stirring means 22, and mixes to a

processed liquid at homogeneity, and the processed liquid which comes to carry out addition mixing of this solidification treatment agent is supplied in pan 4.

[0025] The processed liquid supplied to the pan 4 from the processed liquid depot 11 contacts a drum 3, it is heated on a drum 3, and while arriving at the location of a scraper 7, desiccation solidification of the processed liquid adhering to the front face of this drum 3 is carried out. The amount of [ in a processed liquid ] liquid transpires, it is discharged from gas exhaust 8, and on the other hand, the solid by which desiccation solidification was carried out on the front face of a drum 3 is scratched by the scraper 7, and is discharged from output port 9.

[0026] After supplying fixed time amount and a processed liquid to a pan 4, the closing motion valve 14 is closed, the closing motion valve 15 is opened, and where supply of a processed liquid is suspended, a diluent is supplied to a pan 4 from the diluent depot 13. In using the diluent which mixed the solidification regulator, it opens the closing motion valve 20 in the same way with having mentioned above, and a solidification regulator is supplied in the above-mentioned depot 13 from a hopper 17, and the diluent which comes to carry out addition mixing of this solidification regulator is supplied in pan 4. After the concentration of pan endothecium processing liquid falls and starting supply of this diluent by supply of the diluent into pan 4, desiccation solidification is carried out and most solidification treatment-ed matter in the processed liquid which remains in pan 4 is removed before supply interruption.

[0027] After carrying out fixed time amount supply of the diluent, the closing motion valve 15 is closed, the closing motion valve 14 is opened, and a processed liquid is supplied in pan 4. Henceforth, a processed liquid and a diluent are similarly processed by setting predetermined time and supplying it by turns.

[0028] It processes in other examples of this invention approach, supplying a diluent in a pan intermittently using the equipment of the flow shown in drawing 2, while supplying a processed liquid. That is, it processes by supplying the diluent in the diluent depot 13 intermittently by liquid-sending pump 16B through the closing motion valve 15, supplying the processed liquid in the processed liquid depot 11 in pan 4 by liquid-sending pump 16A through the closing motion valve 14. Supply spacing of the diluent in this case, 1 time of supply time amount, the amount of supply, etc. should just determine suitably the moisture content of pan endothecium processing liquid 5 as a standard like the case of the mutual supply mentioned above.

[0029] In addition, since there is a possibility that a processed liquid may overflow from the inside of pan 4 when a diluent is supplied when it always continues supplying a processed liquid 5 by the fixed flow rate when supplying a diluent intermittently, supplying a processed liquid 5 in a pan like this example, in case a diluent is supplied, it is good to operate it so that only the part equivalent to the amount of supply of the diluent may reduce the amount of supply of a processed liquid temporarily.

[0030]

[Example] Next, a concrete example is given and this invention is further explained to a detail. The example 1 DIP type drum dryer was operated by 130 degrees C and rotational-speed 5rpm whenever [ can surface temperature / of a drum ], and the glycerol (290 degrees C of boiling points) was processed using the processed liquid contained 40% of the weight in the salts of 2 % of the weight and others. The processed liquid supplied the processed liquid for 120 minutes further, after repeating the actuation which suspends supply of a processed liquid and supplies water (diluent) for 15 minutes with the speed of supply of 30 kg/m<sup>2</sup> and time amount instead of a processed liquid after supplying for 120 minutes with the speed of supply of 30 kg/m<sup>2</sup> and time amount 3 times (525 minutes between the total times). In addition, in the processed liquid and the diluent, the diatom earth was beforehand added so that a content might become 10 % of the weight, respectively. O mark showed aging of the moisture content in the processed liquid in a pan in drawing 3. As shown in drawing 3, the moisture content in the processed liquid in a pan held the value of the abbreviation fixed range during processing actuation. Moreover, the scraping nature of a solid was [ be / it / under / down-stream-processing / letting it pass ] good.

[0031] While supplying continuously the same processed liquid as example 2 example 1 with the speed of supply of 30 kg/m<sup>2</sup> and time amount The place which performed processing actuation performed while repeating the dilution actuation which supplies water (diluent) for 15 minutes with the speed of supply of 20 kg/m<sup>2</sup> and time amount for every 60-minute spacing for 285 minutes, The moisture content in the processed liquid in a pan was fixed with about 42 - 50% of value during processing actuation, and the scraping nature of a solid was also good. In addition, in the process which supplies a diluent, only the part equivalent to the amount of supply of a diluent decreased the amount of supply of a processed liquid. Other conditions are the same as that of the case of an example 1.

[0032] It processed on the same conditions as an example 1 except the point which supplied the same processed

liquid as example of comparison 1 example 1 continuously, and did not supply a diluent. About 360 minutes after starting supply of a processed liquid, the viscosity of the solid on the front face of a drum became high, and the scraping workability of the solid by the scraper got worse extremely.

[0033] The diatom earth was not added to example of comparison 2 processed liquid, and a diluent, and also it processed on the same conditions as the example 1 of a comparison. About dozens of minutes after starting supply of a processed liquid, the viscosity of the solid on the front face of a drum became high, and the scraping workability of the solid by the scraper got worse extremely.

[0034]

[Effect of the Invention] Since this invention approach repeats by turns the process which supplies a processed liquid, and the process which suspends supply of a processed liquid and supplies a diluent, and is made to perform it, as explained above, or the diluent was intermittently supplied with supply of a processed liquid, there is no possibility that the solidification treatment-ed matter may be condensed in the processed liquid in a pan by the degree of pole, like the conventional method which supplies a processed liquid continuously. For this reason, supply of a processed liquid is suspended for every fixed time amount, and it is to be worked less necessary to clean the inside of a pan etc. troublesome, and it can process continuously.

[0035] moreover, the solid by which desiccation solidification was carried out on the drum front face by adding solidification regulators, such as the diatom earth, in a processed liquid and a diluent -- scraping -- being easy -- considering as hardness becomes easy. When the high-boiling point matter with the boiling point higher than whenever [ can surface temperature / of a drum ] contains in a processed liquid especially, addition of a solidification regulator is effective, and while being able to prevent the stickiness of a solid in which desiccation solidification was carried out by addition of a solidification regulator on the drum front face, the high-boiling point matter becomes that it is tended with a solidification regulator to adhere a drum, and it has the effectiveness of processing effectiveness improving.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the art of solidification treatment-ed matter content liquid with a DIP type drum dryer which carries out solidification treatment of salts, the organic substance, etc. which are contained in processed liquids, such as wastewater, and collects them.

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## PRIOR ART

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[Description of the Prior Art] In wastewater of industrial liquid waste, a research facility, etc., various salts, organic substance, etc. contain in the condition of having dissolved or distributed. He is trying to stock a river etc., after there being a possibility of producing an environmental pollution problem, therefore performing demineralization processing and organic substance decomposition processing generally and adjusting to the water quality within the permitted limits, if wastewater containing such salts and the organic substance is discharged in a river etc. as it is.

[0003] In this case, when the impurity (salts, organic substance) concentration under wastewater is high, heat-treatment removes a solvent (or dispersion medium), and solidifying a solute (or dispersoid) and carrying out separation removal is performed. Although this approach is useful especially in the perfect closed system with which wastewater discharge is not allowed, since it can also generally discard in the form of a solid, the abandonment approach can also be referred to as being an advantageous approach in the point of becoming easy the top where \*\* is small and handling is easy.

[0004] The art using a DIP type drum dryer which contacts processed liquids, such as wastewater, to the rotating drum equipped with the heating means as an approach of performing solidification treatment, dries the processed liquid adhering to a drum front face, and makes the salt and the organic substance (henceforth the solidification treatment-ed matter) in a processed liquid solidify is known. In processing by this DIP type drum dryer equipment, the approach of processing, while supplying a processed liquid to the depot called a pan continuously at a fixed rate conventionally is adopted.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] Since this invention approach repeats by turns the process which supplies a processed liquid, and the process which suspends supply of a processed liquid and supplies a diluent, and is made to perform it, as explained above, or the diluent was intermittently supplied with supply of a processed liquid, there is no possibility that the solidification treatment-ed matter may be condensed in the processed liquid in a pan by the degree of pole, like the conventional method which supplies a processed liquid continuously. For this reason, supply of a processed liquid is suspended for every fixed time amount, and it is to be worked less necessary to clean the inside of a pan etc. troublesome, and it can process continuously.

[0035] moreover, the solid by which desiccation solidification was carried out on the drum front face by adding solidification regulators, such as the diatom earth, in a processed liquid and a diluent -- scraping -- being easy -- considering as hardness becomes easy. When the high-boiling point matter with the boiling point higher than whenever [ can surface temperature / of a drum ] contains in a processed liquid especially, addition of a solidification regulator is effective, and while being able to prevent the stickiness of a solid in which desiccation solidification was carried out by addition of a solidification regulator on the drum front face, the high-boiling point matter becomes that it is tended with a solidification regulator to adhere a drum, and it has the effectiveness of processing effectiveness improving.

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[Translation done.]

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, the amount of the solidification treatment-ed matter in the processed liquid supplied in the pan in fixed time amount and the amount of the solid by which desiccation solidification was carried out with the drum dryer are not necessarily in agreement, and the imbalanced condition of usually saying that there is little latter one produces them. This is considered to originate in the phenomenon of fall into the natural evaporation from the oil level of pan endothecium processing liquid, and some pans of the scratched solid. For this reason, the amount of the solidification treatment-ed matter in the processed liquid in a pan increases gradually with progress of the processing time. When concentration of the solidification treatment-ed matter in the processed liquid in a pan advances, it may stop adhering to a drum at homogeneity, and when a processed liquid is going too far, stirring of the processed liquid in a pan may become difficult. For this reason, the complicated activity of suspending operation in the phase in which the liquid concentration in a pan rose, removing a pan from equipment casing, discharging the processed liquid in a pan, and cleaning the inside of a pan conventionally was required. When the concentration in the processed liquid in a pan progressed comparatively gently, the cleaning frequency in a pan was also low, it ended, and so big trouble was not caused to processing, but like [ when the suspended solid contains, for example in the processed liquid ], when the concentration rate in pan endothecium processing liquid was remarkable and quick, there was a problem that cleaning in a pan had to be performed frequently.

[0006] Moreover, even if it is the case where concentration of the solidification treatment-ed matter in pan endothecium processing liquid is not advancing so much scraping at the time of the solid by which desiccation solidification was carried out on the drum front face with concentration of the solidification treatment-ed matter in a processed liquid being sticky, or becoming hard too much, and exfoliating a solid from a drum, when description etc. becomes poor, or even if some concentration arises When the viscosity of a processed liquid, the viscosity of a dry matter, etc. change remarkably and cause trouble to processing actuation, it is necessary to perform cleaning in a pan frequently. For example, when high-boiling point alcohol contains in the processed liquid, since high-boiling point alcohol is [ be / it / under / pan endothecium processing liquid / setting ] inferior to the adhesion over a drum front face compared with salts, a concentration degree is large. The high-boiling point alcohol content in the solid by which desiccation solidification was carried out on the drum front face also became high as the concentration of the high-boiling point alcohol in pan endothecium processing liquid became high, but in whenever [ in the usual drum front face / stoving temperature ], the viscosity of a solid became high and high-boiling point alcohol had the problem that the scraping nature of a solid got worse in order not to carry out desiccation solidification.

[0007] This invention was made in view of the above-mentioned point, suspends operation of a DIP type drum dryer, and does not need complicated actuation of performing cleaning in a pan frequently, but it aims at offering the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which can process continuously for a long time.

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MEANS

[Means for Solving the Problem] This invention supplies the processed liquid containing the solidification treatment-ed matter in the pan of (1) DIP type drum dryer. Make the drum which rotates this processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter. The process which supplies the processed liquid containing the solidification treatment-ed matter in said pan, The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by repeating by turns the process which suspends supply of this processed liquid and supplies a diluent in a pan, and performing it, (2) The processed liquid containing the solidification treatment-ed matter is supplied in the pan of a DIP type drum dryer. Make the drum which rotates a processed liquid within a pan contact, and a processed liquid is made to adhere to a drum front face. In the art of solidification treatment-ed matter content liquid with the DIP type drum dryer which dries this processed liquid with a heating means, and solidified the solidification treatment-ed matter. While supplying the processed liquid containing the solidification treatment-ed matter in said pan. The art of solidification treatment-ed matter content liquid with the DIP type drum dryer characterized by supplying a diluent in a pan intermittently, (3) The above (1) characterized by adding a solidification regulator in a processed liquid and a diluent, or the art of solidification treatment-ed matter content liquid with a DIP type drum dryer given in (2), (4) Let the art of solidification treatment-ed matter content liquid with a DIP type drum dryer the above (1) characterized by a processed liquid containing the high-boiling point matter thru/or given in any 1 term of (3) be a summary.

[0009]

[Embodiment of the Invention] Hereafter, this invention approach is explained based on a drawing. Drawing 1 is the explanatory view showing an example of the flow of the DIP type drum dryer equipment concerning operation of this invention, and drawing 2 is the explanatory view showing other examples of the flow of the DIP type drum dryer equipment concerning operation of this invention. In drawing 1 and drawing 2, 1 is a DIP type drum dryer and the drum 3 equipped with the heating means is formed pivotable in the casing 2 of this drum dryer 1. As a heating means of this drum 3, heating-medium supply means, such as steam, are formed in the interior of a drum 3. While a pan 4 is formed under the casing 2 and a processed liquid 5 is supplied in this pan 4, the lower part of said drum 3 is constituted so that it may be immersed in a processed liquid 5. Moreover, in this pan 4, the stirring means 6, such as an agitator for stirring the processed liquid 5 in pan 4, are established. In casing 2, the scraper 7 for scratching a solid from the front face of a drum 3 is formed, and the output port 9 for taking out the scratched solid caudad is formed. Furthermore, the gas exhaust 8 for discharging the evaporated steam is established in the upper part of casing 2.

[0010] The feeder style of a processed liquid and a diluent is connected with the drum dryer 1. The supply line 21 for this feeder style having the processed liquid depot 11 which stores the processed liquid sent from processed liquid liquid-sending Rhine 10, and the diluent depot 13 which stores the diluent sent from dilution liquid transport liquid Rhine 12, and supplying a processed liquid or a diluent in pan 4 of the drum dryer 1 from these depots 11 and 13 is formed.

[0011] 16 (drawing 1), and 16A and 16B (drawing 2) are liquid-sending pumps which supply a processed liquid and a diluent to a pan 4, and liquid-sending pump 16A of a processed liquid and liquid-sending pump 16B of a diluent are separately installed in the equipment of the flow shown in drawing 1 in the equipment of the flow which showed the both sides of a processed liquid and a diluent to drawing 2 to being constituted so that the liquid may be sent with the common liquid-sending pump 16. 14, the closing motion valve which prepared 15 in the outlet side of the processed liquid depot 11 and the diluent depot 13, respectively, and 22 and 23 are the stirring means formed in each depots 11 and 13, respectively.

[0012] This invention is carried out using the equipment constituted like the above. this invention -- scraping of a solid -- although it is the purpose which improves description etc. and a solidification regulator can be mixed to a processed liquid and a diluent if needed, when carrying out addition mixing of this solidification regulator, the equipment which comes to attach the device for supplying a solidification regulator to each depots 11 and 13 is further used for the above-mentioned equipment configuration.

[0013] Such a feeder style consists of supply lines 24 and 25 which connect the feeder 18, the feeder 18, and each depots 11 and 13 for supplying a solidification regulator with the processed liquid depot 11 and the diluent depot 13 from the hopper 17 which stores a solidification regulator, and this hopper 17, and closing motion valves 19 and 20 prepared in each supply line, as shown in drawing 1 and drawing 2.

[0014] Although what matter (solidification treatment-ed matter) which should be solidified, such as salts and the organic substance, dissolved and/or distributed is mentioned, for example to the drainage system medium which makes water and water a subject as a processed liquid, the medium which the solidification treatment-ed matter dissolves and is distributed is not necessarily restricted to water. Moreover, the solidification treatment-ed matter may be used not only as that by which disposal is carried out but as a product. Therefore, like plating waste fluid, lab waste fluid, an ion-exchange-resin playback effluent, etc., this invention approach can be applied, also when solidifying and collecting products from processed liquids, such as a water solution which contains [ like ] a product when performing the solidification of food and disintegration else [ in the case of processing the wastewater discharged mainly from works or a research facility as a processed liquid ]. In addition, the viscous matter with which the desiccation solidification of the solidification object obtained in this invention is not carried out at the part may be contained. Although operation of this invention approach is possible even if there is for example, high-boiling point matter (for example, high-boiling point alcohol, such as a glycerol) as such viscous matter and such high-boiling point matter contains, it is desirable to carry out addition mixing of the solidification regulator in this case, so that it may mention later.

[0015] When a processed liquid is wastewater, and the concentration of impurities, such as salts under wastewater, is comparatively low, it is not a best policy economically to apply such low-concentration wastewater to this invention approach directly. Although demineralization processing of such comparatively low-concentration wastewater is usually carried out by the reverse osmotic membrane method, an electric-type deionization method, etc., the retentate produced by the demineralization processing processing with the application of such retentate to this invention approach, since salt concentration's is high is that a top is also actually desirable.

[0016] On the other hand, the solvent in a processed liquid or a dispersion medium, and a liquid of the same kind are usually used that what is necessary is just the liquid which can dilute a processed liquid as a diluent. For example, also as for a diluent, in the case of the drainage system medium by which the processed liquid made the subject the water which dissolves or distributed the solidification treatment-ed matter, and water, it is usually desirable to use water or a drainage system medium.

[0017] It processes in one example of this invention approach, supplying a processed liquid and a diluent to a pan 4 by turns for every fixed time amount using the equipment of the flow shown in drawing 1 . A processed liquid and a diluent are supplied to a pan 4 by turns with the liquid-sending pump 16 by opening and closing the closing motion valve 14 of the processed liquid depot 11, and the closing motion valve 15 of the diluent depot 13 by turns for every fixed time amount. Although the speed of supply of a processed liquid and a diluent changes with whenever [ rotational-speed / of a drum 3 /, and stoving temperature ], and the class of processed liquid, presentations, etc. and it cannot necessarily determine uniquely, as for 20 - 40 kg/m<sup>2</sup> and time amount extent, and the speed of supply of a diluent, it is [ the speed of supply of a processed liquid ] usually desirable to consider as 20 - 40 kg/m<sup>2</sup> and time amount extent.

[0018] A pan 4 is followed in a processed liquid and it can decide on the time amount which can be supplied suitably in consideration of various conditions, such as size of the class of solidification treatment-ed matter in a processed liquid, concentration, and the rate by which the solidification treatment-ed matter is condensed in a processed liquid in pan 4. For this reason, it is desirable for the time amount which can supply a processed liquid to perform conditioning about the processed liquid which is going to process, and to determine in consideration of the stirring nature of the processed liquid 5 in a pan, the scraping nature from the drum front face of the solid which carried out desiccation solidification, etc. succeeding a pan 4. The time amount which suspends supply of a processed liquid and supplies a diluent to a pan 4 on the other hand follows to supply a diluent as a guide, and it decides on it until it dilutes the solidification treatment-ed matter concentration in pan endothecium processing liquid 5 to the same extent as the concentration of the solidification treatment-ed matter in the original processed liquid. Although the time amount to which the concentration of the solidification treatment-ed matter in pan

endothecium processing liquid 5 may be reduced to a predetermined value is suitably determined by supply of a diluent based on the processed liquid concentration in pan 4, the amount of supply per unit time amount of a diluent, etc. In here, pan endothecium processing liquid concentration changes with rates which the solidified object in the continuation supply time amount of the processed liquid into pan 4 and pan endothecium processing liquid 5 solidifies, and are processed out of the processed liquid 5 in pan 4. For this reason, it is desirable to decide also on the continuation supply time amount of a diluent beforehand based on the data of said conditioning etc.

[0019] Conditions, such as time amount at the time of supplying a processed liquid and a diluent by turns, and a rate It is also possible to determine the moisture content of pan endothecium processing liquid 5 as a scale.

Generally It makes to hold the moisture content of pan endothecium processing liquid 5 to about 30 - 50% of the weight in the case of the processed liquid containing a suspended solid into a standard. It is desirable to supply a processed liquid and a diluent by making into a standard to hold the moisture content of pan endothecium processing liquid 5 to about 40 - 60% of the weight in the case of the processed liquid which does not contain a suspended solid. However, as for the moisture content in pan endothecium processing liquid, it is desirable to perform conditioning and to decide on the speed of supply of a processed liquid and a diluent, supply time amount, etc., as passed and described above to the standard to the last.

[0020] Although whenever [ can surface temperature / of the drum 3 in the drum dryer 1 ] (skin temperature) is determined in consideration of the boiling point of the liquid component in a processed liquid (a solvent or dispersion medium), the melting point of the solidification treatment-ed matter which carries out desiccation solidification, etc., generally it is about 120-140 degrees C. Moreover, the rotational speed of a drum 3 is adjusted so that desiccation solidification of the processed material adhering to drum 3 front face may be carried out while arriving at the location of a scraper 7. Usually, as for the rotational speed of a drum 3, it is desirable to consider as 2 - 10rpm extent.

[0021] The solid by which desiccation solidification was carried out on the front face of a drum 3 can be sticky, or a solidification regulator can be added in a processed liquid and a diluent in order to prevent that become hard too much and the scraping nature of a solid gets worse. As a solidification regulator, there is no solubility over a processed liquid or a diluent, or solubility is a low solid and it is desirable to use the thing on powder. As such a solidification regulator, the diatom earth, a bentonite, etc. are mentioned, for example.

[0022] If the high-boiling point matter with the boiling point higher than whenever [ can surface temperature / of a drum 3 ], for example, a glycerol, tetramethyl ammonium hydroxide (TMAH), etc. are contained in the processed liquid, this high-boiling point matter will be incorporated in the solid by which desiccation solidification was carried out on drum 3 front face, without being gasified. When there are many contents in the processed liquid of these high-boiling point matter, or when the concentration in pan 4 advances, the amount which the high-boiling point matter contains in the solid by which desiccation solidification was carried out increases, and it scraping-comes [ a solid is sticky and ] to be hard. Since the high-boiling point matter will become that it is tended with a solidification regulator to adhere a drum if the above-mentioned solidification regulator is added into a processed liquid and a diluent when the high-boiling point matter contains in the processed liquid, in the case of the processed liquid containing especially the high-boiling point matter, addition of a solidification regulator is effective.

[0023] The addition of solidification regulators, such as the diatom earth, is suitably adjusted according to the class of high-boiling point matter contained in a processed liquid, an amount, etc. Usually, as for a solidification regulator, it is desirable to add so that the content in a processed liquid and a diluent may become about 1 - 15 % of the weight.

[0024] Next, the actuation in the case of processing a processed liquid using the equipment of the flow shown in drawing 1 is explained. The closing motion valve 15 is closed, the closing motion valve 14 is opened, and a processed liquid is supplied in pan 4 of the drum dryer 1 from the processed liquid depot 11 with the liquid-sending pump 16. When using the processed liquid which mixed the solidification regulator, the closing motion valve 19 is opened and specified quantity supply of the solidification regulator is carried out into the above-mentioned depot 11 through a feeder 18 from a hopper 17, and it stirs with the stirring means 22, and mixes to a processed liquid at homogeneity, and the processed liquid which comes to carry out addition mixing of this solidification treatment agent is supplied in pan 4.

[0025] The processed liquid supplied to the pan 4 from the processed liquid depot 11 contacts a drum 3, it is heated on a drum 3, and while arriving at the location of a scraper 7, desiccation solidification of the processed liquid adhering to the front face of this drum 3 is carried out. The amount of [ in a processed liquid ] liquid transpires, it is discharged from gas exhaust 8, and on the other hand, the solid by which desiccation solidification

was carried out on the front face of a drum 3 is scratched by the scraper 7, and is discharged from output port 9. [0026] After supplying fixed time amount and a processed liquid to a pan 4, the closing motion valve 14 is closed, the closing motion valve 15 is opened, and where supply of a processed liquid is suspended, a diluent is supplied to a pan 4 from the diluent depot 13. In using the diluent which mixed the solidification regulator, it opens the closing motion valve 20 in the same way with having mentioned above, and a solidification regulator is supplied in the above-mentioned depot 13 from a hopper 17, and the diluent which comes to carry out addition mixing of this solidification regulator is supplied in pan 4. After the concentration of pan endothecium processing liquid falls and starting supply of this diluent by supply of the diluent into pan 4, desiccation solidification is carried out and most solidification treatment-ed matter in the processed liquid which remains in pan 4 is removed before supply interruption.

[0027] After carrying out fixed time amount supply of the diluent, the closing motion valve 15 is closed, the closing motion valve 14 is opened, and a processed liquid is supplied in pan 4. Henceforth, a processed liquid and a diluent are similarly processed by setting predetermined time and supplying it by turns.

[0028] It processes in other examples of this invention approach, supplying a diluent in a pan intermittently using the equipment of the flow shown in drawing 2, while supplying a processed liquid. That is, it processes by supplying the diluent in the diluent depot 13 intermittently by liquid-sending pump 16B through the closing motion valve 15, supplying the processed liquid in the processed liquid depot 11 in pan 4 by liquid-sending pump 16A through the closing motion valve 14. Supply spacing of the diluent in this case, 1 time of supply time amount, the amount of supply, etc. should just determine suitably the moisture content of pan endothecium processing liquid 5 as a standard like the case of the mutual supply mentioned above.

[0029] In addition, since there is a possibility that a processed liquid may overflow from the inside of pan 4 when a diluent is supplied when it always continues supplying a processed liquid 5 by the fixed flow rate when supplying a diluent intermittently, supplying a processed liquid 5 in a pan like this example, in case a diluent is supplied, it is good to operate it so that only the part equivalent to the amount of supply of the diluent may reduce the amount of supply of a processed liquid temporarily.

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**EXAMPLE**

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[Example] Next, a concrete example is given and this invention is further explained to a detail. The example 1 DIP type drum dryer was operated by 130 degrees C and rotational-speed 5rpm whenever [ can surface temperature / of a drum ], and the glycerol (290 degrees C of boiling points) was processed using the processed liquid contained 40% of the weight in the salts of 2 % of the weight and others. The processed liquid supplied the processed liquid for 120 minutes further, after repeating the actuation which suspends supply of a processed liquid and supplies water (diluent) for 15 minutes with the speed of supply of 30 kg/m<sup>2</sup> and time amount instead of a processed liquid after supplying for 120 minutes with the speed of supply of 30 kg/m<sup>2</sup> and time amount 3 times (525 minutes between the total times). In addition, in the processed liquid and the diluent, the diatom earth was beforehand added so that a content might become 10 % of the weight, respectively. O mark showed aging of the moisture content in the processed liquid in a pan in drawing 3 . As shown in drawing 3 , the moisture content in the processed liquid in a pan held the value of the abbreviation fixed range during processing actuation. Moreover, the scraping nature of a solid was [ be / it / under / down-stream-processing / letting it pass ] good.

[0031] While supplying continuously the same processed liquid as example 2 example 1 with the speed of supply of 30 kg/m<sup>2</sup> and time amount The place which performed processing actuation performed while repeating the dilution actuation which supplies water (diluent) for 15 minutes with the speed of supply of 20 kg/m<sup>2</sup> and time amount for every 60-minute spacing for 285 minutes, The moisture content in the processed liquid in a pan was fixed with about 42 - 50% of value during processing actuation, and the scraping nature of a solid was also good. In addition, in the process which supplies a diluent, only the part equivalent to the amount of supply of a diluent decreased the amount of supply of a processed liquid. Other conditions are the same as that of the case of an example 1.

[0032] It processed on the same conditions as an example 1 except the point which supplied the same processed liquid as example of comparison 1 example 1 continuously, and did not supply a diluent. About 360 minutes after starting supply of a processed liquid, the viscosity of the solid on the front face of a drum became high, and the scraping workability of the solid by the scraper got worse extremely.

[0033] The diatom earth was not added to example of comparison 2 processed liquid, and a diluent, and also it processed on the same conditions as the example 1 of a comparison. About dozens of minutes after starting supply of a processed liquid, the viscosity of the solid on the front face of a drum became high, and the scraping workability of the solid by the scraper got worse extremely.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the explanatory view showing an example of the flow of the DIP type drum dryer equipment concerning operation of this invention.

[Drawing 2] It is the explanatory view showing other examples of the flow of the DIP type drum dryer equipment concerning operation of this invention.

[Drawing 3] It is the graph in the trial of an example 1 which shows aging of the moisture content in the processed liquid in a pan.

[Description of Notations]

1 DIP Type Drum Dryer

2 Casing

3 Drum

4 Pan

5 Processed Liquid

6 Stirring Means

11 Processed Liquid Depot

13 Diluent Depot

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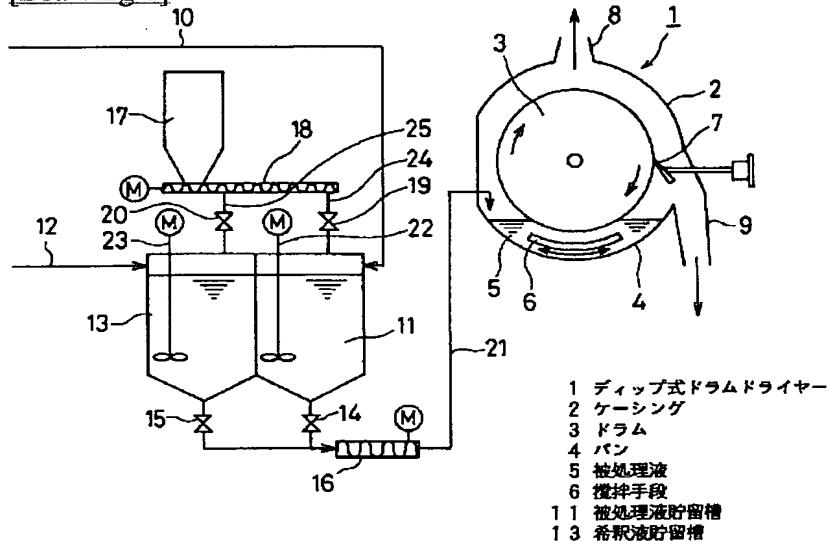
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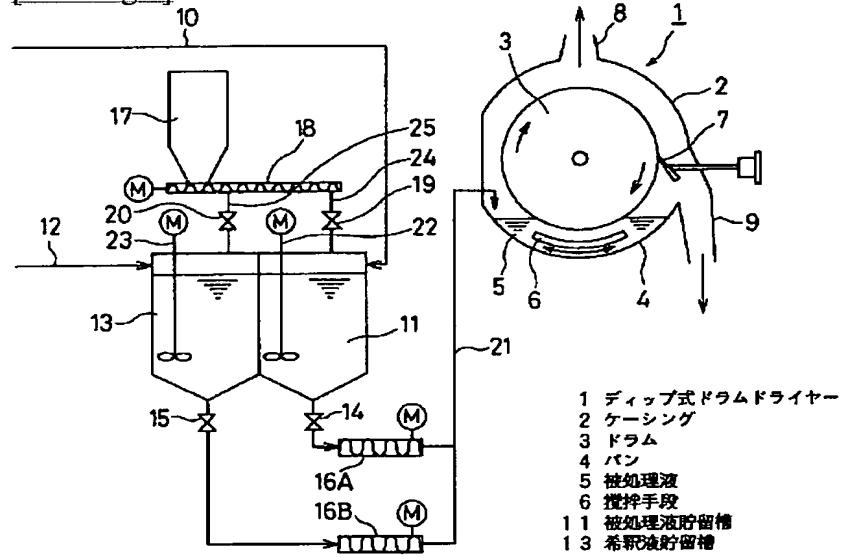
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## DRAWINGS

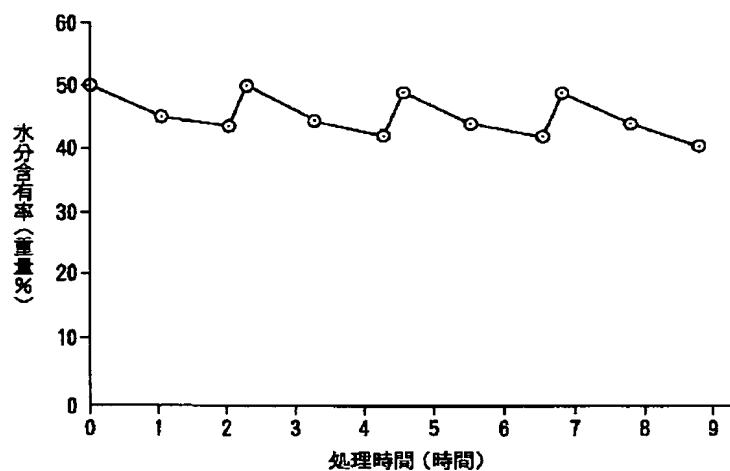
## [Drawing 1]



## [Drawing 2]



## [Drawing 3]



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